

AMENDMENTS TO THE CLAIMS

Complete Listing Of The Claims:

Claim 1 (Currently Amended). An ultraviolet (UV) curing method for applying UV light to UV photo initiators in UV curable inks, coatings, or adhesives, on surfaces of products, articles, or other solid objects, comprising the steps of:

emitting visible light at ~~an intensity~~ from a set group of visible light-emitting diode (LED) assemblies located in an array of rows of light emitting diodes secured to a panel ~~onto the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects facing the visible light and the visible LED assemblies~~ to indicate to a user of the method that power is being supplied to all the light emitting diodes in the array of rows on the panel;

emitting a first wavelength of UV light from a first array group of UV LED assemblies in the array of rows secured to the panel onto the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects, the first group being in one of different rows of the array of rows or being spaced apart in one or more rows of the array facing the first array of UV LED assemblies and the UV light comprising the first wavelength of UV;

emitting a second wavelength of UV light from a second array group of UV LED assemblies secured to the panel onto the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects ~~facing the second array of UV LED assemblies and the UV light comprising the second wavelength of UV light~~, said second array group of UV LED assemblies being in one of different than said first rows of the array or being spaced apart in one or more rows of the array of UV LED assemblies, and said second wavelength of UV Light being different than said first wavelength of UV light;

cooling the UV LED assemblies with a variable speed fan and a heat sink fixed to the panel;

sensing the light intensity of the UV light emitted from the UV LED assemblies;

sensing the temperature of the heat sink or UV LED assemblies;

adjusting and controlling the speed of the variable speed fan in response to one of the sensed temperature of the heat sink or UV LED assemblies or of the light intensity sensed;

maintaining the temperature of the UV LED assemblies at a generally constant temperature to maintain the light intensity of the UV light emitted on the UV curable items at a generally constant level;

moving the panel in proximity to or adjacent the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects while ~~visible light is emitted from the visible LED assemblies and~~ UV light is emitted from the first and second arrays groups of UV LED assemblies;

~~the surfaces of the products, articles or other solid objects facing the visible LED assemblies and the first and second arrays of UV LED assemblies on the panel;~~

distributing the first and second wavelengths of UV light onto the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects ~~facing the first and second arrays of UV LED assemblies secured to the panel while distributing the visible light over all the surfaces of the products, articles or other solid objects facing visible LED assemblies secured to the panel as the panel is being moved; and concurrently uniformly curing to cure~~ the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects ~~facing the first and second arrays of UV LED assemblies so as to produce an identical degree of polymerization over the surfaces of the products, articles or other solid objects facing the first and second arrays of UV LED assemblies~~ with UV light of generally constant intensity.

Claim 2² (Currently Amended). The UV curing method of claim 1 wherein the first and second arrays groups of UV LED assemblies emit UV light at wavelengths between 315 and 400 nm.

Claim 3 (Currently Amended). The UV curing method of claim 1 wherein the first array group of UV LED assemblies emit UV light at a peak

wavelength of 365 nm and the second ~~array~~ group of UV LED assemblies emit UV light at a peak wavelength of 385 nm.

Claim 4 (Previously Presented). The UV curing method of claim 1 including:

injecting an inert gas in a space between the panel and the UV curable items; and

protecting the LED assemblies from splatter

Claims 5-6 (Previously Canceled).

Claim 7 (Canceled).

Claims 8-12 (Previously Canceled).

Claim 13 (Currently Amended). The UV curing method of claim 1 including the step of employing voltage matching techniques whereby the ~~varying~~ current drawn by the UV LED chips of the first and second ~~arrays~~ groups of UV LED assemblies only varies between about 5% and about 10%.

Claims 14-15 (Canceled).

Claim 16 (Currently Amended). An ultraviolet (UV) apparatus for applying UV light to UV photo initiators in UV curable inks, coatings, or adhesives, on surfaces of products, articles or other solid objects, comprising:

a panel;

a ~~set~~ group of visible light-emitting diode (LED) assemblies secured to said panel in an array of rows of light emitting diodes on the panel for emitting visible light ~~on the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects facing the visible LED assemblies~~ for indicating to a user of the apparatus that power is being supplied to all the light emitting diodes in the array of rows of LEDs on the panel;

a first array group of UV LED assemblies secured to said panel in one of different rows of the array or being spaced apart in one or more rows of the array for emitting a first wavelength of UV light on the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects facing the first array group of UV LED assemblies;

a second array group of UV LED assemblies secured to said panel in one of different rows of the array or being spaced apart in or more rows of the array for emitting a second wavelength of UV light on the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects facing the second array group of UV LED assemblies, ~~said second array of UV LED assemblies being different than said first array of UV LED assemblies~~, said first wavelength of UV light being different than said second wavelength of UV light;

a heat sink mounted to said panel for dissipating heat from said UV LED assemblies;

a variable speed fan mounted adjacent said heat sink for blowing air on said heat sink or UV LED assemblies to cool said heat sink or said UV LED assemblies;

a light sensor for sensing the intensity of UV light emitted from said UV LED assemblies; and,

a control circuit coupled to said light sensor and to said variable speed fan for controlling the light intensity of the UV light emitted from said UV LED assemblies and the temperature of the UV LED assemblies by regulating the speed of the air blown by said variable speed fan on said heat sink or UV LED assemblies and by varying the speed of said variable speed fan in response to the sensed intensity of the UV light thereby to maintain a substantially constant intensity of light for the curing of the UV curable items.;

a panel-moving mechanism for moving said panel in proximity to or adjacent to the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects facing the visible and UV LED assemblies while ~~visible light~~ and generally constant intensity UV light comprising the first and second wavelengths of UV light are emitted from the ~~visible LED assemblies and the first and second arrays groups~~ of UV LED

~~assemblies on~~ onto the UV curable inks, coatings or adhesives ~~ever all~~ on the surfaces of the products, articles or other solid objects facing ~~the visible LED assemblies and~~ the first and second arrays groups of UV LED assemblies;

~~a controller said control circuit also being~~ operatively connected to the ~~visible LED assemblies and~~ the first and second arrays groups of UV LED assemblies and the panel-moving mechanism for concurrently distributing the first and second wavelengths of UV light from the UV LED assemblies equally onto the UV curable inks, coatings or adhesives ~~ever all~~ on the surfaces of the products, articles or other solid objects facing the first and second arrays of UV LED assemblies while ~~visible light is distributed from the visible LED assemblies~~ as said panel is being moved to uniformly cure the UV curable inks, coatings or adhesives ~~to an identical degree of polymerization over all the surfaces of~~ on the products, articles or other solid objects facing ~~the first and second arrays of UV LED assemblies~~ with generally constant intensity UV light from said first and second groups of UV LED assemblies.

Claim 17 (Canceled).

Claim 18 (Currently Amended). The UV curing apparatus of claim 16 wherein the first array group of UV LED assemblies emit UV light at a peak wavelength of 365 nm and the second array group of UV LED assemblies emit UV light at a peak wavelength of 385 nm.

Claim 19 (Currently Amended). The UV curing apparatus of claim 16 including a gas injector for injecting an inert gas in a space between the panel and the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects facing the visible LED ~~assemblies~~ assemblies.

Claim 20 (Currently Amended). The UV curing apparatus of claim 16 including a splatter resistant protective device comprising a plastic or glass sheet or plate positioned between the array of rows of UV ~~and visible~~ LED assemblies and the UV curable inks, coatings or adhesives on the surfaces of the products,

articles or other solid objects facing the UV and visible LED assemblies for substantially preventing splatter from the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects facing the UV and visible LED assemblies from contacting the array of rows of UV and visible light LED assemblies.

Claim 21 (Canceled).

Claim 22 (Canceled).

Claims 23-26 (Canceled).

Claim 27 (Previously Presented). The UV curing apparatus of claim 16 wherein the UV LED assemblies comprise large junction UV LED chips over 400 microns on a side.

Claim 28 (Canceled).

Claims 29-30 (Previously Canceled).

Claims 31 and 32 (Canceled).

Claim 33 (Currently Amended). The UV curing apparatus of claim 32 16 including

a temperature sensor mounted adjacent said heat sink or UV LED ~~chips~~ assemblies and coupled to said control circuit for sensing the temperature of said heat sink or UV LED ~~chips~~ assemblies.

Claims 34-36 (Previously Canceled).

Claim 37 (Currently Amended). The UV curing apparatus of Claim 32 16 including:

a printer with a printing head for printing UV curable ~~ink on the UV curable~~ inks, coatings or adhesives on the surfaces of the products, articles or other solid objects ~~facing the UV LED chips~~;

a turntable for carrying the printed UV curable items past the UV LED ~~chips~~ assemblies; and

a mechanism for rotating or indexing said turntable carrying the printed inks, coatings or adhesives on the surfaces of the products, articles or other solid objects ~~facing the UV LED chips~~ past the UV LED ~~chips~~ assemblies.

Claim 38 (Currently Amended). The UV curing apparatus of claim ~~32~~ 16 wherein:

said moving mechanism comprises a conveyor for moving the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects ~~facing the UV LED chips~~ past the UV LED ~~chips~~ assemblies as UV light is emitted from the UV LED ~~chips~~ assemblies onto the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects ~~facing the UV LED chips~~.

Claim 39 (Currently Amended). The UV curing apparatus of claim ~~32~~ 16 wherein said moving mechanism comprises an oscillator for oscillating or reciprocating said ~~substrate panel~~ of UV LED ~~chips~~ assemblies in proximity to or adjacent said UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects ~~facing the UV LED chips~~ as UV light is emitted from said UV LED ~~chips~~ on assemblies onto the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects ~~facing the UV LED chips~~.

Claim 40 (New). The UV curing apparatus of claim 16 wherein said group of visible light-emitting diode assemblies is a row of visible light-emitting diode assemblies in the array of rows of LED assemblies on said panel.

Claim 41 (New). The UV curing method of claim 1 wherein the group of visible light-emitting diode assemblies is a row of visible light-emitting diode assemblies in the array of rows of LED assemblies on the panel.